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THE MERITS OF LODGEPOLE PINE POLES

by

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Forest Utilization Service

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I. V. Anderson

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November 8, 1947

THE MERITS OF LODGEPOLE PINE POLES [1]

By I. V. Anderson [2]

The average person has little or no appreciation of the universal use of wood for transmission poles. There are but few moments in the everyday life of any of us when we are not in sight of wooden telephone poles or power transmission poles. We see them from our office or living room window - see them while traveling by car, train, or plane. In fact, we are confronted by wooden poles every waking moment of our lives. They stand on all sides of us ready to serve humanity by bringing us two of the greatest of human conveniences and comforts - the telephone and electricity. Wood is the cheapest material engineering science has yet found for this purpose. Were this not true these modern conveniences would still be available to the few and not to the majority of the American people.

To you people of rural Montana it is increasingly important that you have the cheapest pole material that meets your need. Montana ranches are larger and farther apart than the farms of the central and eastern United States; hence more poles are needed per home unit served. The intensively farmed states of Iowa, Illinois, Wisconsin, and others don't have forests to supply their own poles. You people in Montana are fortunate in that respect. Many of your valleys are rimmed by mountains containing an abundant supply of lodgepole pine. This species has been proved to be an excellent timber for transmission poles.

A little later on I should like to mention service records of lodgepole pine when used for transmission poles.

Lodgepole Pine Pole Supplies

But at this point I should like to discuss pole supplies available to Montana cooperatives and utilities.

Your most abundant pole species is lodgepole pine. Table 1 shows the estimated number of transmission poles standing in the forests of the United States today. Note that this species is third in the Nation's supply of short poles and fifth in the number of long poles. Another point in favor of Montana pole supplies is that 50 million, or more than one half, of the short poles (20 to 35 feet long) contained in the Nation's lodgepole pine forests are located in Montana, while 8 million

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1/ Delivered at the annual meeting of the Montana REA Association, Great Falls, Montana, November 8, 1947.

2/ In Charge, Forest Utilization Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Montana.

FORM NO. NE 1

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REMARKS:

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Table 1. Estimated number of poles in the United States by species and length on all land ownerships.

Species	Estimated number of poles		Subtotal	
	20 to 35 feet	40 feet and longer	20 to 35 feet	40 feet and longer
	M Pieces			
Southern yellow pine	424,574	26,730	424,574	26,730
Douglas-fir	106,860	55,070		
Western larch	15,600	21,600		
Ponderosa pine	28,120	13,145		
Lodgepole pine	93,900	12,800		
Spruces	19,810	9,900		
Western hemlock	19,320	6,080		
True firs	13,030	5,380		
Western redcedar	13,415	5,320	310,055	129,295
Jack pine	10,000	2,500		
Red pine	2,000	1,000		
White cedar	15,000	800		
Softwoods, Northeastern States	590	4,310		
Hardwoods, Northeastern States	23	207	27,613	8,817
Total			762,242	164,842

or almost two thirds of the long poles (40 feet and longer) are also found here.

The entire Northern Rocky Mountain area - including Montana, the nine northern counties of Idaho, and eastern Washington - is the Nation's storehouse of poles 40 feet and longer. Table 2 shows an estimated 83 million long poles (40 feet and longer) of all species in the region. The Pacific Northwest, embracing Washington and Oregon, produces over ten times as much lumber as the Northern Rocky Mountain region, yet its long-pole supplies are less than half those of the Northern Rocky Mountain region. While the Deep South and Southeastern regions of the country contain more short poles, one does not have to be overly optimistic to rate the Northern Rocky Mountain area among the Nation's leading regions as a potential source of poles.

The mere fact that lodgepole pine pole stumpage is abundant is a point in favor of this species. If you start with lodgepole pine poles in your lines you can be assured of a permanent and stable supply because most of Montana's lodgepole pine forests are being managed on a sustained-yield basis.

Table 2. Number of poles in the United States by region and length.

Region	Millions of poles	
	20 to 35 feet, inclusive	40 feet and longer
Northern Rocky Mountain	127	83
Pacific Northwest	122	34
Deep South	193	14
Southeast	231	13
Central Rocky Mountain	37	6
Lake States	27	4
Southwest	12	7
Intermountain	10	1/5
California	3	1/6
Central States	1/6	Negligible
Northeastern States	1/2	4
Total	762 2/3	165 +

The pole-processing industry is conveniently located in relation to supply. The present capacity of Montana pole plants is in excess of 500,000 poles per year. Treating plants are located at Troy, Libby, Kalispell, Hamilton, Philipsburg, Butte, Helena, and Bozeman. In addition, plants for processing white poles are located at Arlee, Kalispell, Thompson Falls, White Sulphur Springs, and Lincoln. With this array of plants there is no doubt that Montana electrical cooperatives and utilities will be well provided with poles.

Properties of Lodgepole Pine Poles

The mechanical strength of lodgepole pine is considerably over that of western redcedar. The American Standards Association Pole Committee 05 has assigned a working fiber stress of 6600 pounds to lodgepole pine compared to 5600 pounds for cedar. Cedar, of course, has been the accepted standard for poles for many years. Douglas-fir, our leading structural timber species, as well as southern pine carries a working fiber stress of 7400 pounds, or only 1000 pounds greater than lodgepole pine. These working fiber stresses are directly related to ground-line measurements of poles. Hence a lodgepole pine pole of a given class and length must have a slightly larger ground-line circumference than a similar Douglas-fir or southern pine pole. For instance, the minimum ground-line measurement of a class 6, 35-foot lodgepole pine pole is 28.5 inches or 1 inch larger than the minimum of 27.5 inches for a similar Douglas-fir pole.

Informed pole-line design engineers and some of the large pole consumers are now urging the use of the working fiber stress for lodgepole pine

as the base from which working stresses for all other species should be computed. This is ample evidence of the high regard engineers have for the mechanical strength of lodgepole pine.

The straight, clean, knot-free trunk of the lodgepole pine tree is another high point in favor of this species as a pole. The excellent form of the tree is reflected in high yields of poles per acre of forest land. Timber sales in the White Sulphur Springs area have yielded as high as 200 poles per acre meeting American Standards Association specifications, and yields of 40 or 50 poles per acre are the usual thing.

In the untreated wood, none of our pine pole species rates as high as cedar. As most of you know, cedar wood contains oils and extractives that are toxic to wood-rotting fungi. Hence cedar poles will last from 12 to 15 years untreated in most locations. Untreated lodgepole pine poles will last from 5 to 7 years under Montana service conditions; therefore it is apparent that preservative treatment by some reliable process is an absolute necessity. Some Montana plants are now using creosote, while others are using pentachlorophenol mixed with fuel oil. A few poles have been treated by the Osmose treatment, a patented preservative compound of which sodium fluoride is the principal toxic ingredient.

Service Tests of Lodgepole Pine

Creosote has been used for over 40 years as a wood preservative and its worth when applied properly has been well established. Pentachlorophenol has been used for a much shorter period. Its toxic ingredient is chlorine and phenol, and its name "penta" implies that five molecules of chlorine are contained in the compound. Tests of about 8 years' duration have indicated very promising results with this preservative. We have tried tetrachlorphenol on lodgepole pine fence posts near Bozeman in the Squaw Creek Ranger Station Fence. A solution consisting of 3 percent tetrachlorphenol and 97 percent petroleum oil by weight was used. These posts have been in the ground for 12 years, and 95 percent of them appeared sound at the ground line this past summer.

Another interesting service test of lodgepole pine poles has been performed using Anaconda Wood Preservative. This is principally arsenic trioxide and was applied as a paste to the butt section of pole stubs extending downward from about 6 inches above the ground line. The telephone line is located in Bridger Canyon near Bozeman. Present indications are that the service life of the stubs was increased to 16 or 17 years, or two to three times as long as untreated wood. Arsenic trioxide is poisonous to livestock, so could prove dangerous to use in an area where the treated poles were accessible to livestock.

Longer service-test records are available for Montana installations of lodgepole pine treated with creosote than treated with any other preservative. A tabulation of these tests showing type of treatment and estimated service life is interesting:

Project and location	Kind of material treated	Preservative used	Estimated average life, years
Ammen Fence, Missoula, Mont.	Posts	Creosote hot-and-cold bath (nonpressure)	35
Choteau-Ear Mountain Telephone Line, Choteau, Mont.	Pole stubs	Ditto	30 to 35
Gallatin Telephone Line, Gallatin Gateway, Mont.	Pole stubs	Ditto	25 to 30
Dillon Telephone Line, Dillon, Mont.	Poles	Ditto	30 to 35
Babcock Placer Fence, Rocker, Mont.	Posts	Creosote pressure-treated	20 to 25

The foregoing tabulation shows that lodgepole pine posts and poles when properly nonpressure-treated with creosote can be expected to last from 30 to 35 years. Examinations made during the past year have indicated that the untreated portion of the pole or post above ground will still be serviceable at the end of the 30- or 35-year period. There is, however, a possibility that in poles set in the more humid locations in Montana limited amounts of shell rot or top rot may take place after 25 or 30 years of service. However, I question whether full-length treatment will be justified in an effort to offset this small amount of top rot.

No service tests on pentachlorophenol-treated lodgepole pine have been running long enough to draw definite conclusions as to the service life. This preservative, however, is more toxic than creosote and has given an excellent account of itself to date.

The poor showing for pressure-treated creosoted stubs in the Babcock Placer Fence as indicated in the foregoing tabulation was no doubt due to faulty treatment. One would expect a service life at least as long for lodgepole pine pressure-treated as nonpressure-treated with creosote.

What the Pole Industry Means to Montana

For a while back in the early part of 1945 it appeared that everybody wanted to get into the pole business. The need for poles to electrify rural America was given widespread publicity in late 1944 and early 1945. Bankers, clerks, exlumberjacks, R.E.A. cooperative managers, and others beat a path to our door asking where they could get timber and

the know-how to get into the pole business. As a result we did much to encourage a Montana pole industry. We have had a remarkable development of this industry in Montana. We are proud of it. We feel that Montana and the Nation will profit from this new business.

Montana lodgepole pine forests are largely overmature and ready for cutting. An outlet for poles gives the forester a chance to practice silviculture through utilization. This will result in a more vigorous and healthy forest for future generations. The forester can utilize the better-formed, proper-sized trees for poles. Other trees of proper size but poorly formed can be used for mining timbers, while other trees needing removal can be used for pulpwood along with the residue from pole and mine-timber cutting. Hence we are getting closer to the forester's dream of an integrated type of forest utilization under which each tree and its component parts are used for that purpose for which they are best suited.

Montana also profits economically. The pole industry has brought to the state new payrolls employing over 1,500 men. New capital investments of 1½ million dollars have been made in plants and equipment. During 1946 the railroads derived revenues of almost one million dollars for poles shipped out of Montana. Processed poles that were shipped out of Montana in 1946 were valued at 3 million dollars. This all spells prosperity for Montana, and what is good for Montana is good for you.

Conclusion

Lodgepole pine is an excellent pole species and will give 30 to 35 years of service in Montana with proper nonpressure treatments. Since the state has an abundance of this wood it would seem wise for Montanans to use their own product. You already have a going pole industry in the state capable of expanding to a production of three fourths of a million poles annually. Industries are built from men, material, capital, and markets. The pole industry of Montana has all of these but the markets are highly competitive. I believe that in the long run both R.E.A. cooperatives and the utilities will find it to their best interest to use lodgepole pine poles coming from near the point where they are used.

LIST OF PREVIOUS PUBLICATIONS IN THIS SERIES

Station Paper No.	
1	*A preliminary study of root diseases in western white pine, by John Ehrlich, October 1939.
2	*Possibilities of partial cutting in young western white pine, by E. F. Rapraeger, January 1940.
3	Blister rust control in the management of western white pine, by Kenneth P. Davis and Virgil D. Moss, June 1940.
4	Possibilities of wood-pulp production in the northern Rocky Mountain region, by E. F. Rapraeger, March 1941.
5	Results to date of studies of the durability of native woods treated and untreated, by C. N. Whitney, revised January 1946.
6	Changes in Benewah County forest statistics, by Paul D. Kemp, July 1947.
7	A guide for range reseeding on and near the national forests of Montana, by C. Allan Friedrich, October 1947.
8	Pole blight - a new disease of western white pine, by C. A. Wellner, November 1947.
9	Management practices for Christmas tree production, by C. A. Wellner and A. L. Roe, November 1947.

*Out of print. Loan copies may be obtained upon request.